DRAFT *JANUARY 4, 2005*

EASTER RIVERS AND MOUNTAINS NETWORK

VITAL SIGNS PRIORITIZATION PROCESS

SUMMARY:

Network vital sign prioritization is one of the most important steps in the NPS Inventory and Monitoring (I&M) Program's planning process as it guides the remainder of program development. As such, the ERMN sought the input of its Science Advisory Committee (SAC) during a meeting held December 14, 2004 at University Park, PA. The SAC and network staff spent the majority of the meeting discussing the vital signs prioritization process, hearing from members of the group that had been through the process in affiliation with other networks, and arriving at consensus on how to proceed. It was decided that the ERMN would generally follow proposed methods of prioritization by the national I&M program which incorporate ecological significance and management significance/legal mandate to prioritize vital signs. Though some details were left to be determined at a later date, the following represents the general process and workflow that the SAC suggested for the ERMN.

The ERMN proposes to accomplish its vital signs prioritization in six steps:

1. Generation of a vital signs long list via park scoping process;
2. Paring down of long list to a more manageable number by subject matter experts based on ecological significance and value as indicators;
3. Vital signs prioritization workshop that will serve as peer review of step 2 by larger science community; (**Target date for workshop is during the week of May 16 at Penn State**)
4. Prioritization of final short list of vital signs from step 3 by park staff based on management significance and legal mandate;
5. Integration of park and workshop feedback and resolution of ambiguity will be handled by network staff and the ERMN Science Advisory Committee.

6. ERMN Board of Directors will approve final, prioritized list of vital signs.

The purpose of this prioritization is to identify at the onset vital signs that the network considers most important without considering in detail the methods of measurement or their feasibility. The ranking is not intended to establish a numerical order in which vital signs will be implemented. For many vital signs, feasibility is closely tied to sampling design and will be addressed during Phase 3 planning.

**Before this process is implemented it will be presented to park staff during individual park visits in January 2005. Any feedback will be incorporated and the ERMN will seek formal approval of the prioritization process (NOT the vital signs list) from its Board of Directors by late January/early February.*

DETAILED DESCRIPTION OF THE PRIORITIZATION PROCESS:

Step 1: Generation of the ERMN Vital Signs "Long List"

Appendix H of the ERMN Monitoring Plan was meant to represent the draft "long list" of potential vital signs for the network and was submitted along with Phase 1 reporting in October 2004. The list has subsequently been revised and expanded (December 2004). The generation of this list was achieved primarily through the series of park scoping meetings (Fall 2003/Winter 2004) by network staff to discuss park resources, management issues and species or communities of special concern, but also through the review of park Resource Management Plans, Water Management Plans, and other reports and relevant documents; results of the Geologic Resource Evaluations (Summer 2004); discussions with and reports by ERMN cooperators; and any planned or opportunistic discussions with Park natural resource staff as well as Regional and I&M staff. The initial draft of this long list, in essence, was the best attempt by Network staff to assimilate and interpret all the information gained on Park resources and potential monitoring needs during the formulation of the Phase 1 Report.

However, due to the importance of the completeness of Appendix H, Network staff will solicit additional vital signs input from parks during a series of January 2005 park visits. The purpose of these visits will be to review and discuss the ERMN Phase 1 Report, the prioritization

process, the long list of vital signs and associated monitoring objectives, and to allow the parks additional opportunity to add vital signs to the long list. It is anticipated that there will be revisions to Appendix H during these meetings but once all parks have provided input, this will be treated as the final long list of vital signs for the network.

Step 2: Ecological Significance I -- Subject Matter Experts evaluate and reduce "long list". Natural resources in the ERMN have been separated into three generic ecosystem types (which follow the conceptual models presented in Chapter 2 of the Monitoring Plan), with obvious overlap between them: 1. Terrestrial Ecosystems; 2. Large River Ecosystems; 3. Tributary Watershed Ecosystems. Network staff will solicit a Subject Matter Expert for each ecosystem type with significant expertise in the area and familiarity with appropriate ecological indicators. This subject matter expert will evaluate each vital sign currently on the long list and ultimately reduce the long list to a more manageable list of potential vital signs based on ecological significance and value as an indicator.

One of the major challenges of the vital signs prioritization process is one of presentation. It has been well demonstrated that participants in human-subjects social science research struggle to rank or order long lists of items in a way that makes sense and accurately represents their beliefs and values (*add citations*). Methods such as pair-wise comparisons can present items to participants in a manner that are more manageable, however when lists become long this can still be an involved and resource intensive task. For this reason, any ordinal ranking or prioritization of the +/-60 vital signs identified in Appendix H would be laborious, difficult and may not yield reliable or repeatable results. What's more, park staffs have many responsibilities and therefore limited time to participate in the I&M planning process. Finally, there was general consensus within the SAC due to limited resources that in the end, the network would only be able to monitor the most obvious, relevant, and scientifically supported (i.e., "no-brainer") vital signs (along with perhaps a few others). Furthermore, the "no-brainer" vital signs based solely on ecological significance could be identified by most subject matter experts even with limited specific knowledge of network/park resources. It was therefore decided that network staff should work with subject matter experts to pare down the long list presented in Appendix H to a more manageable number of vital signs before seeking park input on prioritization.

Subject matter experts will be provided the long list of vital signs relevant to their respective system (Large Rivers, Tributary Watershed, Terrestrial Systems), chapters 1 and 2 of the ERMN Monitoring Plan along with park resource overviews from network staff. Experts will be asked to evaluate each vital sign based on the following criteria and their own expert opinion. These prioritization criteria have been modified from other national programs, including other NPS Vital Sign Monitoring Networks:

Ecological Significance:

- There is a strong, defensible linkage between the vital sign and the ecological function or critical resource it is intended to represent.
- The vital sign represents a resource or function of high ecological importance based on the conceptual model of the system and the supporting ecological literature.
- The vital sign provides early warning of undesirable changes to important resources. It can signify an impending change in the ecological system.
- The vital sign is sufficiently sensitive to detect specified change; has a high signal to noise ratio and does not exhibit large, naturally occurring variability.

The subject matter expert will also be tasked with reviewing relevant literature and to further develop the conceptual ecosystem models illustrating the linkages between vital signs and ecosystem process, function or effect. Based on their literature review and modeling exercises they will choose a subset of vital signs that are most relevant, ecologically significant and feasible indicators of natural resource condition in network parks. They will write up a fully cited narrative supporting their proposed vital signs. It is anticipated that this narrative will serve both as justification for their vital signs selection as well as a narrative explaining the linkages of vital sign within the conceptual ecosystem models.

This “working short list” of vital signs generated by subject matter experts along with the justification narratives will be presented to park staff for review and as another effort to seek their input, involvement and approval of this process. Any pressing issues (e.g., concerns about

vital signs not on the working short list) can be discussed prior to the next step of the prioritization process, the workshop.

Step 3: Ecological Significance II - Vital Signs Prioritization Workshop

During the spring/early summer of 2005 network staff will hold a vital signs prioritization workshop (**Target date is during the week of May 16 at Penn State University**). Much of the workshop will be organized around the three ecosystem types with breakout groups for each led by the subject matter experts who did the initial paring down of vital signs. This workshop will provide an opportunity for subject matter experts to present their work (justification for the chosen short list of vital signs and linkages to the conceptual models) to peers in the scientific community, and an opportunity for the scientific community to participate in the vital signs prioritization process of the ERMN. During this workshop the current working list of vital signs may be added to, deleted from or substitutions may be made depending on group process, discussion and consensus. The workshop will be separated into two sections: 1. To reach scientific consensus and finalize a short list of vital signs for the ERMN; 2. To evaluate the merits of individual vital signs and priority group them accordingly.

Subject matter experts will have the opportunity to present their vital signs list and justification to their peers during the first section of the workshop. Following their presentation they will field questions from the group and facilitate/moderate discussion. If network staff has done a good job of inviting a diverse and qualified group of scientists to the workshop there should be lively debate of the short list of vital signs, but also consensus on the appropriate vital signs to consider further. Further discussion and modification of the conceptual ecological models will take place simultaneously. Attendees of the workshop will be encouraged to participate and propose additions, deletions or substitutions to the short list of vital signs and changes to the models. Having already had their chance to make their case for their proposed vital signs, the subject matter experts serving as group facilitators will be charged with guiding discussion and seeking out consensus in the group. The result of this section of the workshop will be a short list of vital signs for each ecosystem type upon which there is scientific consensus among workshop attendees.

The second part of the workshop will involve prioritizing each vital sign on the working short list described above into one of three categories. Each category will have a numerical value associated with it (3=High, 2=Medium, or 1=Low Priority) that will used to integrate with the park management significance ranking (described below). Decisions will be made by consensus of the work group.

Some vital signs will be considered in more than one workgroup (i.e., Weather and Climate; Water Quality – Core Parameters) and may be ranked differently in each workgroup. In these cases, the vital sign will be brought before all participants in the workshop for discussion and final consensus on its rank.

Throughout the workshop there will be opportunities for breakout groups to interact with one another and for attendees to give the ERMN general feedback on vital signs, prioritization, planning, existing monitoring programs and any other wisdoms that their expertise might lend; the more outside interest and involvement in the ERMN monitoring program that can be stimulated during this workshop, the better monitoring program the network will be able to design and implement.

The final result of the ERMN vital signs prioritization workshop will be a priority grouped (high, medium, and low priority) list of vital signs based on ecological significance that has been peer-reviewed, is justifiable, supported by conceptual ecosystem models, and upon which there is general scientific consensus.

Step 4: Park Prioritization based on Management Significance and Legal Mandate

Following the prioritization workshop, ERMN staff will compile the finalized short list of network vital signs and solicit input from park staff once again. Parks will be presented with the short list of vital signs from all three ecosystem types resulting from the workshop and asked to prioritize these vital signs according to management significance and legal mandate. Parks will not be presented with results of the priority groupings based on ecological significance done at the workshop. Evaluation of each vital sign in terms of Management Significance will be

according to the following criteria (again based on other national programs, including other NPS Vital Sign Monitoring Networks):

Park Management Significance

- **Legal/policy mandate**: How important is monitoring this resource/vital sign for satisfying legal or policy mandates? [3=high importance (required), 2=moderate importance (specifically identified), 1=low importance (generally identified)]
- **Potential to support management decisions**: Does monitoring this vital sign directly link to the information needed for carrying out a key management decision or evaluating the outcome of a management decision? [3=strong application, 2=moderate application, 1=weak application]
- **Importance of resource management**: How important (for management) is the resource or issue represented by the vital sign, relative to other resources or issues in the park? [3=high importance, 2=moderate importance, 1=low importance]
- **The indicator will produce results that are clearly understood and accepted** by park managers, other policy makers, and the general public, all of whom should be able to recognize the implications of the indicator's results for protecting and managing the park's natural resources. [3=clearly understood, 2=generally understood, 3=poorly understood]

The I&M program is a park-based program who's chief mission is to provide information to park managers on the status, conditions and trends of park natural resources (see I&M document citation). For this reason ERMN network staff have concluded that park staff will be provided an opportunity to respond for *each* park that they help to manage (i.e. managers who have shared duties among multiple parks will be asked to submit multiple prioritizations). However, because the network is interested in one unified voice from each park, in parks where there exist multiple natural resource staff they must synthesize their knowledge and understanding of park resources to submit only one prioritization for the park (not from each member of the staff). ERMN network staff will be available to provide neutral facilitation of this park based prioritization process if their assistance is specifically requested by park staffs.

The final result of park vital sign prioritization will be a three class priority grouped list of vital signs based on management significance/legal mandate for each individual park.

Step 5: Integration and resolution of final prioritization

Upon receiving all of the results of the park prioritization process, network staff will integrate this information with the results of the vital signs prioritization workshop. The final ranking of vital signs will be weighted evenly between the results of the Workshop (50% Ecological Significance) and the park rankings (50% Management Significance). The ecological significance value is a straight forward 3, 2, or 1 based on High, Medium, or Low priority, respectively. The final value for management significance will be the result of two rounds of averaging. The first round of averaging will take the score from the 4 criteria such that each park will have an average value/rank for each indicator based on the 4 criteria outlined above. The second round of averaging will be among all nine ERMN parks for each vital sign.

Finally, the ecological significance value and the park management significance value will be averaged. (This process will be automated via the database format we will implement). The final, prioritized list of vital signs will be reviewed by the Science Advisory Committee with any discrepancies and ambiguities addressed.

Step 6: Approval of prioritized vitals signs by ERMN Board of Directors

This list will then be presented to the Board of Directors for final approval. Again, the purpose of this prioritization is to identify at the onset vital signs that the network considers most important without considering in detail the methods of measurement or their feasibility. The ranking is not intended to establish a numerical order in which vital signs will be implemented (and “ties” are OK). For many vital signs, feasibility is closely tied to sampling design and will be addressed during Phase 3 planning.